



RESEARCH HIGHLIGHT

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INVESTIGATING MOISTURE IN SEASONAL HOUSING

INTRODUCTION

Almost any Canadian who has rented or stayed in a cottage over the summer can wax poetic about the sensory experience of cottage life. If pressed, a good number of those Canadians could give a fairly accurate description of the welcoming musty smell upon opening the cottage at the first of the season. That first "sniff" test invariably leads to "airing out" – opening all windows and doors, possibly washing moldy surfaces down ... the telltale signs of the presence of moisture problems are part of our national summer heritage. However poetical and nostalgic these signs may feel, they can be detrimental to both the health of the building and the health of occupants. Not only do rough summer cottages suffer from moisture problems, but other seasonally occupied or buildings do as well. Moisture problems and "closed up" buildings are strongly related.

For the most part, building science and housing research have focused on alleviating and eliminating moisture problems in buildings with year-round occupant loads. In Canada, the standard sources of moisture in year-round homes are occupant cooking, washing and bathing, as well as respiration. Measures to alleviate and eliminate moisture loads have led to mechanical ventilation requirements being included in the National Building Code.

Seasonally occupied homes have moisture problems too. However, in these homes the occupant loads are missing. What, then, are the causes of moisture problems when the occupants are not living in these buildings? Is it stored moisture released during drier periods? Is it condensation of airborne moisture due to solar heating and night cooling? Are there ways to minimize or divert

moisture loads in closed up houses so that high humidity and mold growth can be avoided? This research project set out to investigate these moisture problems, using seasonally occupied cottages as the research sample.

RESEARCH PROGRAM

The research started with a survey of cottage conditions and use that was conducted by telephone and the internet. From this sample, a planned dozen cottages were selected for visits that included an "EnerGuide for Houses" inspection and blower door test. The majority of the dwellings in the survey and all the monitored cottages were in the contractor's home province, Nova Scotia. The contractor recommended changes to all cottages to counter the moisture problems identified. Five dwellings had interior conditions (temperature and relative humidity) monitored the winter before renovations and the winter following, to see if there were changes in the hygrothermal behaviour of the buildings due to the modifications made. The intent of the research was to include a variety of cottage types, as potential solutions will vary depending upon the availability of off-season electrical power or heating. The four types were:

1. No external power/power shut off during periods of non-occupancy
2. Electric power but no heating or cooling options
3. Possibility of heating, cooling and/or dehumidification options
4. Periods of absence that last several seasons



There were 34 surveys returned, with the majority from Nova Scotia but several from New Brunswick, Ontario, and Manitoba. Survey results covered both insulated and uninsulated cottages and houses. Buildings over a nominal 1000 sq. ft. (93 m²) were labelled as houses, for the purpose of this survey. Foundations ranged from full basements to pole crawl spaces, with two slabs on grade. The oldest dwellings were built in the 1860's; the newest post-2000.

This was a biased sample as the project was looking for seasonal dwellings with moisture problems. "Airing out" and mold clean-ups were common in the spring. Ten of the dwellings had periods of standing water in their foundations. Five had mold growth during the occupied periods. Window condensation was common.

In the end, of the twelve volunteered seasonal dwellings, ten houses were visited and tested. Eight carried out some or most of the recommendations made to reduce moisture problems. Starting in November 2003, five of these eight houses were monitored for temperature and relative humidity levels from November through April for two years. All five of these homeowners carried out most of the project team's recommendations in the summer of 2004. Datalogging in these houses suffered from equipment failures. Given that many of these buildings were

inaccessible by conventional transportation in winter, failures could not be quickly noticed and remedied. There was full data on two of the five houses over the winter prior to retrofits, and on four of five houses following the remedial work. See the sidebar for the level of detail available from the full report on each seasonal dwelling.

The disconcerting finding of this research was that these houses were typically plagued by foundation moisture problems and that the solutions involved repair or redoing the foundations. It is no surprise that seasonal dwellings are even more apt to have leaky basements or uncovered crawl spaces than permanent houses. However, the goal of this research was to experiment with ventilation, shading, or humidity control to minimize incidental moisture problems in unoccupied buildings. The foundation problems uncovered in the investigation require foundation fixes, not changes to ventilation strategies. Water should be stopped at its source. Unfortunately, owners of cottages or summer houses were reluctant to spend significant funds for repair of the moisture problems, to even a lesser degree than homeowners with wet basements. Due to these factors, the innovative ventilation solutions proposed at the start of the survey were not implemented.

Research activities	House description	Advice and response
<ul style="list-style-type: none"> • EGH and IAQ audit • Project team site visit • Temp & RH monitored • Airtightness test results: 16.93 AC/H 	<ul style="list-style-type: none"> • Built 1940, three additions (1960/80, 2003/4) • Original one-storey cottage on open crawlspace (conc. block), slab-on-grade addition (poured conc.), newest addition on open crawlspace (conc. block) Latest addition insulated but not finished at site visit. • Various window types throughout, no awnings or shutters, about 65% of glazing oriented N • Oil forced-air with non-EPA woodstove, no ventilation • 20m from ocean (to N) • Moisture problems: mold on entry and during occupation, standing water, evidence of leakage, window condensation 	<ul style="list-style-type: none"> • Put continuous vapour barrier down over dirt floor • Install two small inline fans to exhaust crawlspaces • Homeowner covered dirt floors in crawlspaces with polyethylene sheets, installed two small inline fans to exhaust stale/moist air from crawlspaces • The fans will be used when the cottage is opened, not run through the winter



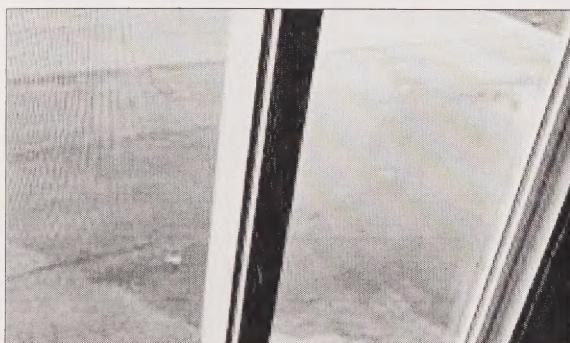
Exterior: West Elevation



Exterior: vents too close to grade



Interior: water damage at window sill



Exterior: standing water on flat roof.

RESULT, IMPLICATIONS FOR OWNERS OF SEASONAL HOUSING

The results of the research survey are not startling:

1. Seasonal dwellings are likely to have moisture problems
2. "Airing out" and mold clean-up are common chores when re-occupying seasonal housing
3. Foundation moisture problems are a prime source of excessive humidity in the houses surveyed. There are solutions for foundation leakage and condensation. Most of those surveyed would rather deal with some of the mold implications than put the thousands of dollars needed into foundation repair.
4. The monitoring did show temperature and humidity conditions that would provide winter/spring condensation in these dwellings. Innovative ventilation options are identified in the report but they were not tested in the research project due to a lack of suitable houses.

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Housing Research at CMHC

Under Part IX of the *National Housing Act*, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

This fact sheet is one of a series intended to inform you of the nature and scope of CMHC's research.

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